

structure, like the horn of a sphingid caterpillar, but retractile.

While writing on Oriental Zonitoids, I take the opportunity to mention that the entirely white variety of *Ariophanta laevipes* (Müller) is var. *alba* Ckll., named in Science Gossip, April, 1885, p. 77, fig. 55 (from Calcutta).

---

### THE SNAILS OF ZION NATIONAL PARK<sup>1</sup>

BY A. M. WOODBURY

Fifteen species of snails have to date been collected in Zion National Park, Utah. One of them, the *Oreohelix*, is large enough to readily attract attention and common enough to be seen on most all of the trails of the Park. The balance are smaller, not readily seen and must be hunted for in order to be found. Of the fifteen species, two are fresh water snails with well developed shells. The other thirteen are terrestrial snails, of which, one is a slug.

Of the fresh water species, *Gyraulus* is found in clear water ponds not frequented by floods, while *Petrophysa* lives on the walls of the canyon where the water trickles down over the face of the cliffs from springs or seeps. This species appears to be limited in distribution to the main Zion Canyon and was named *Physa (Petrophysa) zionis* by Pilsbry in 1925 on account of this limited distribution. Molluscan life appears to be absent from the river in the canyon on account of the frequent corrosive floods.

The land snails inhabit principally the moist sheltered wooded spots where dead or decaying vegetation, such as logs and leaves is abundant. Some forms, such as *Gonyodiscus* and *Agriolimax*, appear to be more prevalent where moisture is constantly present and not subject to periodic drought. Other forms, such as *Pupilla*, *Vitrina*, and *Vitrea*,

<sup>1</sup> Contribution from the Zoological Laboratory of the University of Utah.

are abundant in spots that are subject to prolonged drought.

The climatic conditions in Zion Canyon are so modified by the half-mile high precipitous walls that many cool shady nooks may be found separated from the exposed hot dry slopes by but the turn of a point or the round of a bend. This makes for many isolated spots where colonies of snails abound and many other slopes and areas devoid of such life. In these colonies, many associated species may often be found living together under practically the same conditions.

Below the Weeping Rock, underneath the trees alongside a tiny trickle of water, the following species were found living together, the area examined being only a few feet in diameter:

*Cochlicopa lubrica* (Müller), *Vitrina alaskana* Dall, *Zonitoides arborea* (Say), *Gonyodiscus cronkhitei* (Newcomb).

In the shady nook at the north foot of the saddle between the Great Organ and Angel Landing (Saddle Nook), an even greater variety was found. Under the leaves and vegetation, near the edge of a small rill, and underneath the trees and vines away from the moisture of the stream, the following species were found:

*Pupilla syngenes* (Pilsbry), *Cochlicopa lubrica* (Müller), *Vitrina alaskana* Dall, *Vitrea indentata* Say, *Zonitoides arborea* (Say), *Gonyodiscus cronkhitei* (Newcomb), *Succinea avara* Say.

Above the Emerald Pool, where the dripping water from the cliffs above keeps the vegetation continuously wet, I found *Succinea avara* Say thriving among the decaying leaves underneath the clumps of grass. Slightly lower down where the vegetation was moist but not wet, I found the following:

*Succinea avara* Say, *Agriolimax campestris* (Binney), *Vitrina alaskana* Dall, *Zonitoides arborea* (Say), *Gonyodiscus cronkhitei* (Newcomb).

Farther down the slope among the dry leaves of maples and grapevines, I found:

*Oreohelix cooperi* (Binney), *Cochlicopa lubrica* (Müller).

These are typical sheltered spots of the canyon and many

other similar associations of species may be found. It is noticeable, however, that *Pupilla syngenes* and *dextroversa* were found only in comparatively dry situations under trees and grapevines some distance from water. It is also noticeable that snail life appears to be absent in pure stands of oak or where oak leaves predominate among the decaying vegetation. On the other hand, molluscan life appears to be most abundant in the groves where leaves of maple, ash, box elder, or grapevine are abundant.

In the literature,<sup>1</sup> *Oreohelix haydeni oquirrhensis* is reported as occurring at the Narrows in Zion Canyon. For three summers, I have searched for specimens at the place indicated but have failed to find any. I believe the record to be erroneous.

I am indebted to Dr. H. A. Pilsbry of Philadelphia, who visited the Park in 1925, and to Bryant Walker of Detroit, Michigan, for their kind assistance in the determination of material and to Dr. R. V. Chamberlin of the University of Utah for aid and advice in the preparation of this report.

The following snails have been found in Zion National Park, and specimens of each are now in the Park collection and in the collection of the Zoology Museum of the University of Utah.

#### VALLONIA GRACILICOSTA Reinh.

This snail is rare and hard to find. It was obtained in only one place, under the dry leaves under cottonwood trees near the Narrows.

#### OREOHELIX COOPERI (W. G. Binney).

This is the largest and most conspicuous snail of the Park. The shells may be found in practically all of the sheltered nooks and the live animals may usually be found following a rain crawling around among the vegetation.

These snails are evidently preyed on by some small mammal, probably mice or rats. I have found piles of shells that had been bitten through in such a way as to extract the contents.

<sup>1</sup> Vanatta, Naut., XXXIV, 1921, p. 141.

Shells of this snail have been collected at the Narrows, Saddle Nook, Weeping Rock, The Grotto, Emerald Pool, Court of the Patriarchs, Wiley's Retreat and many other places.

PUPOIDES MARGINATUS (Say).

This snail is apparently very rare in the Park. In four seasons of casual collecting, I have found two shells only. At the time of collecting, I did not distinguish them from either Cochlicopa or Pupilla and consequently do not know the definite nook from whence they came.

PUPILLA SYNGENES (Pilsbry).

This is a very small snail and hard to find. I have to date located only one pure colony, at the Saddle Nook between the Angel Landing and the Great Organ, although a few shells of this left handed spiral have been found among colonies of the right handed spiral form (*P. s. dextroversa*).

I have discovered the feeding grounds of the living snails among the dead leaves under ash trees and grapevines in dry situations away from proximity to water.

PUPILLA SYNGENES DEXTROVERSA Pilsbry and Ferriss.

The habitat of this subspecies is practically the same as that of *P. syngenes*. It is reported that colonies of the two often live together and I have found it so in one or two cases. This form has been collected at the Public Camp and at the Narrows, in both cases under ash trees, one case also having grapevine leaves.

COCHLICOPA LUBRICA (Müller).

This snail is of widespread occurrence in the Park. It is found in most all of the terrestrial snail associations and under a great variety of conditions, from the continually moist situations under the vegetation alongside small streams to those situations subject to prolonged periodic drought among the dead leaves and vegetation under cover of the trees.

I have taken it on the Narrows trail, at Saddle Nook,

Weeping Rock, The Grotto, Emerald Pool Canyon, Wylie Retreat, and the Court of the Patriarchs.

*VITRINA ALASKANA* Dall.

This snail is also of very widespread occurrence in the Park and is found in nearly all the terrestrial snail associations, ranging from conditions of continual moisture to those of periodic drought, among the dead leaves of such plants as maple, ash, box elder and grapevines.

I have taken it on the West Rim, Saddle Nook, Weeping Rock, The Grotto, Emerald Pool Canyon, Court of the Patriarchs and the Narrows.

*GLYPHYALINIA INDENTATA* (Say).

This snail is not very common in the Park but may be found in many of the terrestrial snail associations. It has been collected at Saddle Nook, The Grotto, and Emerald Pool Canyon. It undoubtedly occurs in many other of the protected parts of the canyon.

*EUCONULUS FULVUS* (Müller).

This snail is very rare. I have taken it at only one point, alongside a small trickle of water under moist decaying leaves and other vegetation at the forks of the Lodge-Emerald Pool and the Lodge-Court of the Patriarchs trails.

*ZONITOIDES ARBOREA* (Say).

This species is of common occurrence among the terrestrial snail associations. It is found in the moist parts of the dead leaves and the decaying vegetation subject to periodic drought, and even in damp logs where it often buries itself in the decaying wood.

It has been collected at Weeping Rock, Saddle Nook, The Grotto, Emerald Pool Canyon and elsewhere.

*GONYODISCUS CRONKHTEI* (Newcomb).

This deep-brown rough-ribbed snail is of quite widespread occurrence. The live snail is found most frequently in damp decaying logs and under decaying vegetation beside small watercourses where moisture is continually

present, but its shells are often found in protected nooks among the dead leaves in situations subject to periodic drought.

It has been collected at the Narrows, Saddle Nook, Weeping Rock, The Grotto, Emerald Pool Canyon and the Court of the Patriarchs.

*SUCCINEA AVARA* Say.

This common snail may be found under a great variety of conditions, from moist decaying logs in the sheltered nooks to protected spots on more exposed situations subject to prolonged periodic drought. Outside the Park, I once found a shell under a small bush out in the desert, where it must have been subjected to prolonged dry spells.

I have collected the shells at the Narrows, Saddle Nook, Weeping Rock, The Grotto, Emerald Pool Canyon, the Court of the Patriarchs and elsewhere.

*GYRAULUS VERMICULARIS* (Gould).

This flat planorboid snail appears to live only in fresh water pools not subject to floods, feeding on the green algae in such pools. I have collected it only in the pool in the Court of the Patriarchs.

*PETROPHYSA ZIONIS* (Pilsbry).

These fresh-water snails appear to be found only on the walls or steep slopes of Zion Canyon where the water from springs or seeps trickles down over the faces of the cliffs. With an extremely large aperture and abnormally large last whorl of their shells, they seem to have adapted themselves to such conditions. In their natural position on the face of the cliff, they appear as small black hemispherical dots scarcely distinguishable in appearance from certain round black algal forms. They appear to feed on the small algae growing in the trickling water.

*AGRIOLIMAX CAMPESTRIS* (Binney).

This slug is of common occurrence where conditions are favorable. It appears to feed on decaying vegetation, especially wood, and appears to require perennial moisture.

It is often found in moist decaying logs associated with *Zonitoides arborea* or *Succinea avara*.

In addition to the snails actually found in the Park, there are a few species found in other parts of the Dixie region extending off below the Park, whose range may extend up into Zion Canyon. The following forms, specimens of which are in the Park collection, are thus found in the surrounding region:

PISIDIUM CONCINNULUM Sterki.

Collected near Central, Washington Co., Utah, at a small spring locally known as Cane Spring on the St. George-Enterprise road. It was found near the head of the stream in the clean loose sand in the stream bed.

LYMNAEA OBRUSSA Say.

This fresh water snail looks very similar superficially to *Succinea avara* but may readily be distinguished by its habitat, this form being found in the water, whereas *S. avara* is a land snail. I have collected this *Lymnaea* near St. George, in the clear water streams where green algae abound. It is found in company with *Physella virgata* and appears to feed on the green algae.

PHYSELLA VIRGATA (Gould).

This fresh-water snail is found in most of the clear water streams, springs, and ditches of Dixie which are not subjected to corrosive floods. It is especially abundant in those sluggish streams or ponds where green algae abounds and upon which it appears to feed. It has not yet been taken in the streams of the Park.

I have collected it in the streams at St. George, Washington, Central, Enterprise, Ivins, Beaver Dam Wash, and in the Santa Clara Bench reservoir at Ivins. In the sluggish streams, it appears not to reach its highest development, being on the average only about half the size of those found in the Ivins reservoir.

## BIBLIOGRAPHY

- Henderson, Junius, Mollusca of Colo., Utah, Mont., Idaho and Wyoming. U. of Colo. Studies, Vol. XIII, No. 2, 1924.
- Pilsbry, H. A., and James H. Ferriss, Mollusca of the South-western States, V. The Grand Canyon and Northern Arizona. Proc. Ac. of Nat. Sci. of Phila., March, 1911.
- Pilsbry, H. A., Note on Anatomy of Oreohelix with Catalog of the Species. Proc. Ac. of Nat. Sci. of Phila., May, 1916.
- Pilsbry, H. A., Notes on Anatomy of Oreohelix, II, Proc. Ac. of Nat. Sci. of Phila., Feb., 1917.
- Pilsbry, H. A., A Fresh-water Snail, *Physa zionis*, Living under Unusual Conditions. Proc. Ac. of Nat. Sci. of Phila., Vol. LXXVII, 1925.
- Vanatta, E. G., Shells of Zion National Park, Utah, THE NAUTILUS, Vol. XXXIV, pp. 140-141, 1921.
- Walker, Bryant, Hints on Collecting Land and Fresh-water Mollusca.

---

**THE LAND SHELLS OF KAMCHATKA**

BY WALTER J. EYERDAM

During the past summer of 1928 I spent three and one-half months in Kamchatka and upon various occasions made diligent efforts to collect land shells. The results were very meager compared with the rewards I have had in more southerly regions. Although a considerable area of South Kamchatka was covered this time, I did not add any additional species to those found in 1925, around the Gulf of Kronotzki and the mouth of the Kamchatka River, several hundred miles farther north.

The following species were taken mostly in the region around Avacha Bay, Avacha River and the adjacent mountains—Polovina, Korjatskaya and Avachinskaia Sopka.

*Vitrea alaskana* (Dall), common.

*Cochlicopa lubrica* (Müll.), common.

*Euconulus fulvus* (Müll.), not common.

*Euconulus fulvus alaskensis* Pilsbry, common.